

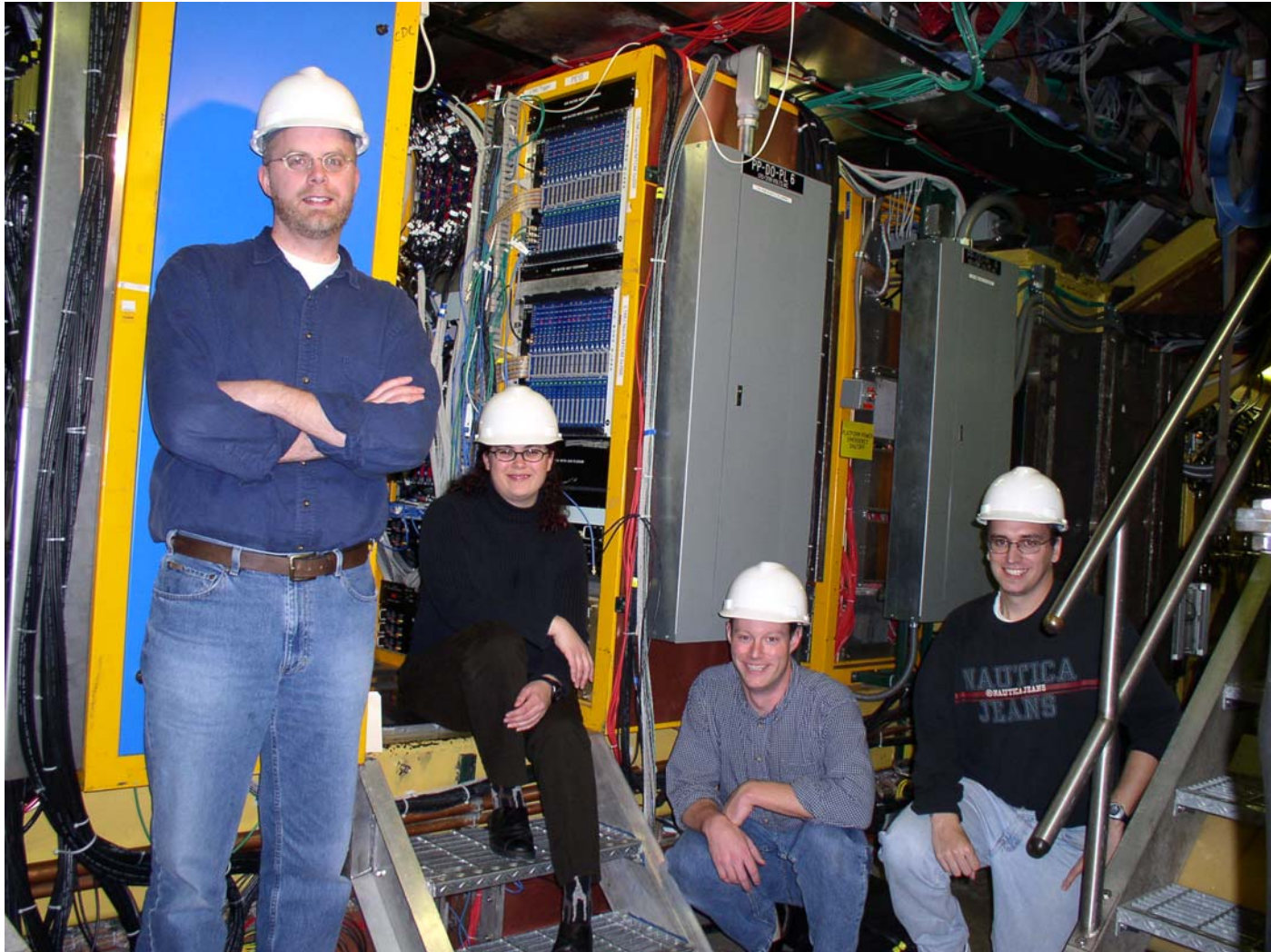


# Level 1 Muon Trigger

- Arizona holds primary responsibility for the Run II L1MU trigger hardware and software
  - ♦ Hardware
    - Certification
    - Day-to-day operations, monitoring, and maintenance
    - Trouble-shooting (sometimes the entire muon system)
    - Support for L1CTT and FPD
  - ♦ Software
    - L1MU trigger simulator and certification
    - Online control and monitoring ("Examine")
    - Offline "reconstruction" of L1MU data
    - Data analysis (e.g. efficiency, purity, optimization)
- These tasks are fundamentally important ones for DØ (and a full-time job)

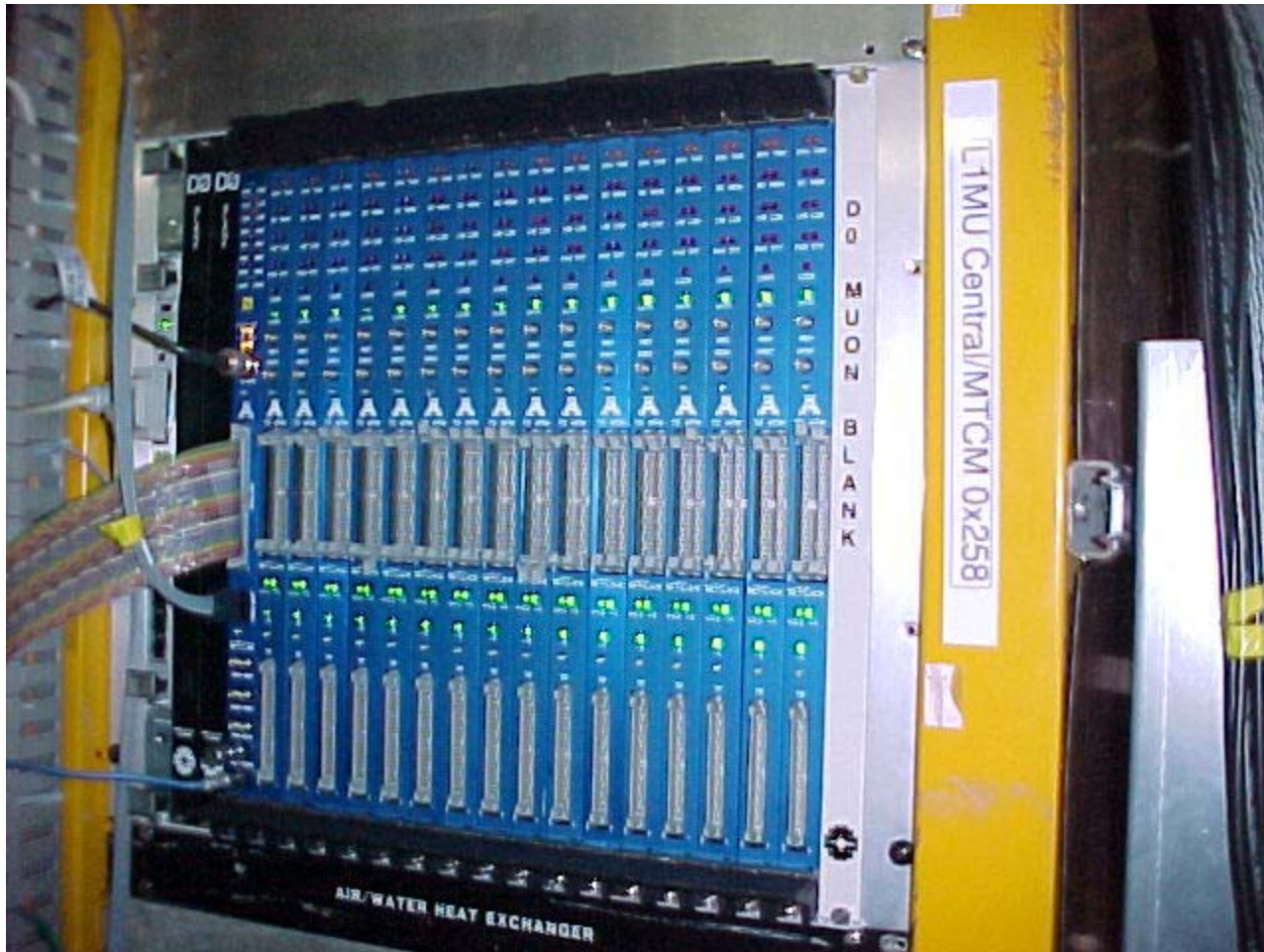


# Arizona L1MU Crew





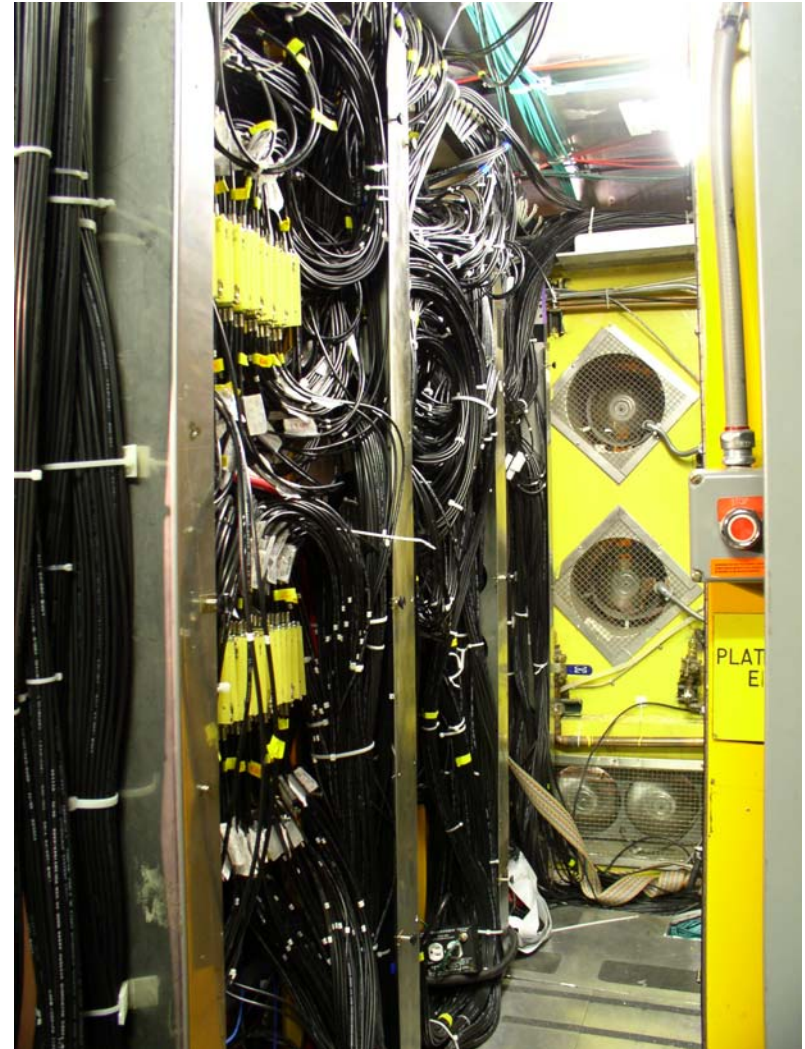
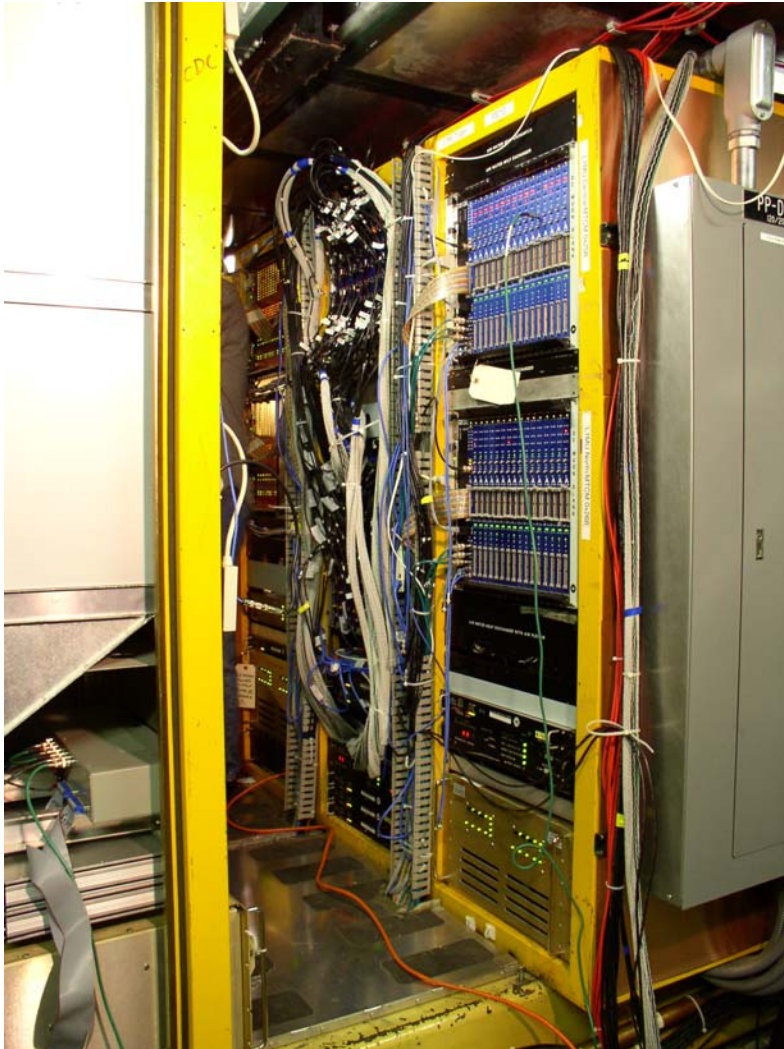
# L1MU Trigger in the Collision Hall







# L1MU Trigger in the Collision Hall





# Shifter GUI (Crate Reload)

Crate controls

PDT masks

MDT masks

SCI masks

CFT masks

L1 Muon Crate Panel

crate id	crate commands			crate status	
MCNNA	cold start	restore	check	offline	not touched
MCNNB	cold start	restore	check	offline	not touched
MCNSA	cold start	restore	check	offline	not touched
MCNSB	cold start	restore	check	offline	not touched
MCNC	cold start	restore	check	offline	not touched
MTCC	cold start	restore	check	offline	not touched
MTCN	cold start	restore	check	offline	not touched
MTCS	cold start	restore	check	offline	not touched
MTM	cold start	restore	check	offline	not touched

cold start all crates

command status

reset masks

write trigger mask files

exit no write

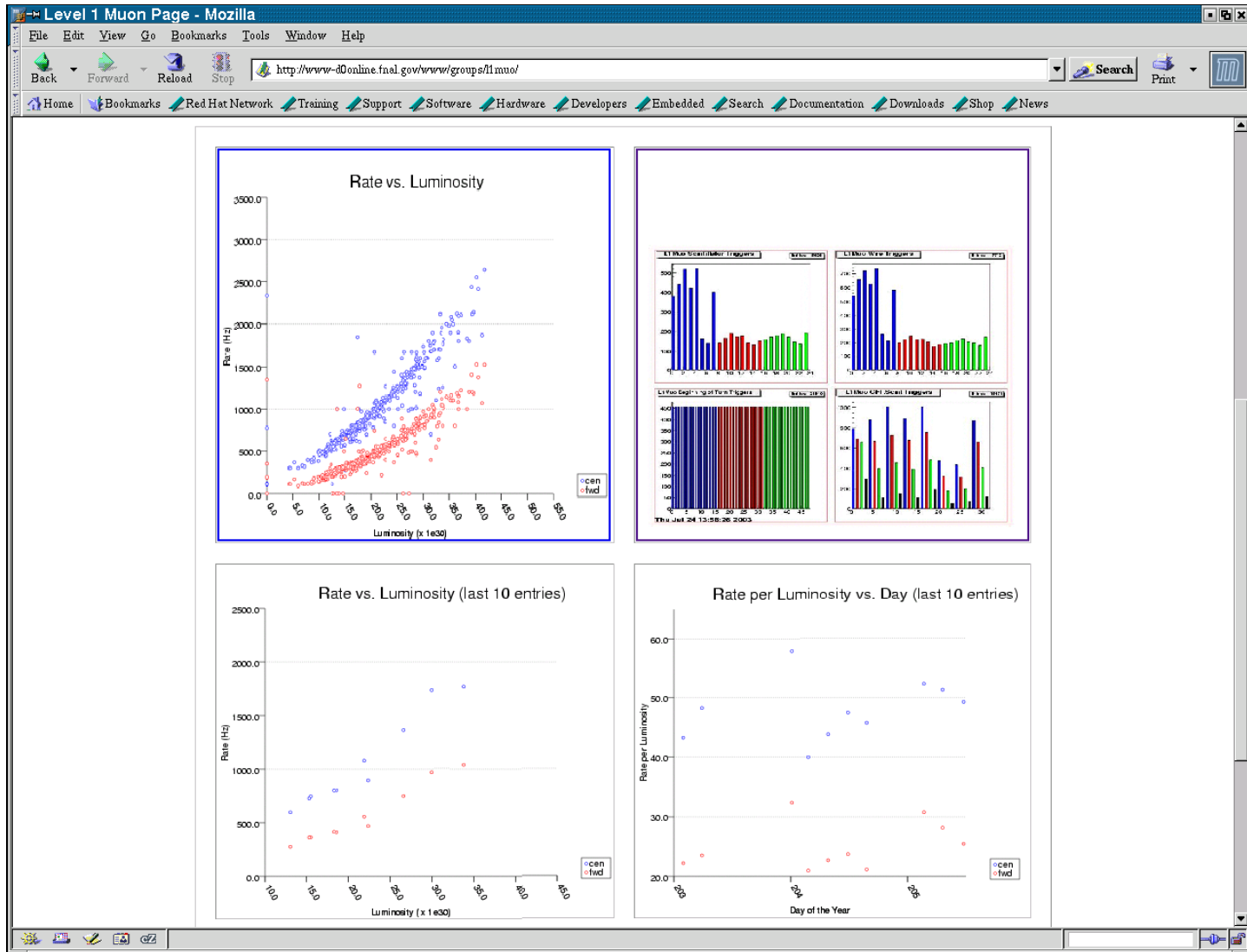


# Shifter GUI (PDT Mask)

Crate controls	PDT masks	MDT masks	SCI masks	CFT masks								
PDT test config												
CMETP(X38)	0	1	2	3	4	5	6	7	8	9	10	11
A	<input checked="" type="checkbox"/> 021				<input checked="" type="checkbox"/> 201		<input checked="" type="checkbox"/> 211		<input checked="" type="checkbox"/> 221		<input checked="" type="checkbox"/> 231	<input checked="" type="checkbox"/> 241
B	<input checked="" type="checkbox"/> 011	<input checked="" type="checkbox"/> 031			<input checked="" type="checkbox"/> 101		<input checked="" type="checkbox"/> 111		<input checked="" type="checkbox"/> 121		<input checked="" type="checkbox"/> 131	<input checked="" type="checkbox"/> 141
CMESP(X39)	0	1	2	3	4	5	6	7	8	9	10	11
A	<input checked="" type="checkbox"/> 020		<input checked="" type="checkbox"/> 200	<input checked="" type="checkbox"/> 210	<input checked="" type="checkbox"/> 220	<input checked="" type="checkbox"/> 230	<input checked="" type="checkbox"/> 240	<input checked="" type="checkbox"/> 207	<input checked="" type="checkbox"/> 217	<input checked="" type="checkbox"/> 227	<input checked="" type="checkbox"/> 237	<input checked="" type="checkbox"/> 247
B	<input checked="" type="checkbox"/> 010	<input checked="" type="checkbox"/> 030	<input checked="" type="checkbox"/> 100	<input checked="" type="checkbox"/> 110	<input checked="" type="checkbox"/> 120	<input checked="" type="checkbox"/> 130	<input checked="" type="checkbox"/> 140	<input checked="" type="checkbox"/> 107	<input checked="" type="checkbox"/> 117	<input checked="" type="checkbox"/> 127	<input checked="" type="checkbox"/> 137	<input checked="" type="checkbox"/> 147
CMEBP(X3A)	0	1	2	3	4	5	6	7	8	9	10	11
A	<input checked="" type="checkbox"/> 026						<input checked="" type="checkbox"/> 136				<input checked="" type="checkbox"/> 216	<input checked="" type="checkbox"/> 246
B	<input checked="" type="checkbox"/> 016		<input checked="" type="checkbox"/> 036		<input checked="" type="checkbox"/> 106		<input type="checkbox"/> 116		<input type="checkbox"/> 146		<input checked="" type="checkbox"/> 206	<input checked="" type="checkbox"/> 236
CMWTP(X34)	0	1	2	3	4	5	6	7	8	9	10	11
A	<input checked="" type="checkbox"/> 022				<input checked="" type="checkbox"/> 202		<input checked="" type="checkbox"/> 212		<input checked="" type="checkbox"/> 222		<input checked="" type="checkbox"/> 232	<input checked="" type="checkbox"/> 242
B	<input checked="" type="checkbox"/> 012		<input checked="" type="checkbox"/> 032		<input checked="" type="checkbox"/> 102		<input checked="" type="checkbox"/> 112		<input checked="" type="checkbox"/> 122		<input checked="" type="checkbox"/> 132	<input checked="" type="checkbox"/> 142
CMWSP(X35)	0	1	2	3	4	5	6	7	8	9	10	11
A	<input checked="" type="checkbox"/> 023		<input checked="" type="checkbox"/> 203	<input checked="" type="checkbox"/> 213	<input checked="" type="checkbox"/> 223	<input checked="" type="checkbox"/> 233	<input checked="" type="checkbox"/> 243	<input checked="" type="checkbox"/> 204	<input checked="" type="checkbox"/> 214	<input checked="" type="checkbox"/> 224	<input checked="" type="checkbox"/> 234	<input checked="" type="checkbox"/> 244
B	<input checked="" type="checkbox"/> 013	<input checked="" type="checkbox"/> 033	<input checked="" type="checkbox"/> 103	<input checked="" type="checkbox"/> 113	<input checked="" type="checkbox"/> 123	<input checked="" type="checkbox"/> 133	<input checked="" type="checkbox"/> 143	<input checked="" type="checkbox"/> 104	<input checked="" type="checkbox"/> 114	<input checked="" type="checkbox"/> 124	<input checked="" type="checkbox"/> 134	<input checked="" type="checkbox"/> 144
CMWBP(X36)	0	1	2	3	4	5	6	7	8	9	10	11
A	<input checked="" type="checkbox"/> 025						<input checked="" type="checkbox"/> 135				<input checked="" type="checkbox"/> 215	<input checked="" type="checkbox"/> 245
B	<input checked="" type="checkbox"/> 015		<input checked="" type="checkbox"/> 035		<input checked="" type="checkbox"/> 105		<input checked="" type="checkbox"/> 115		<input checked="" type="checkbox"/> 145		<input checked="" type="checkbox"/> 205	<input checked="" type="checkbox"/> 235
reset masks		write trigger mask files					exit no write					



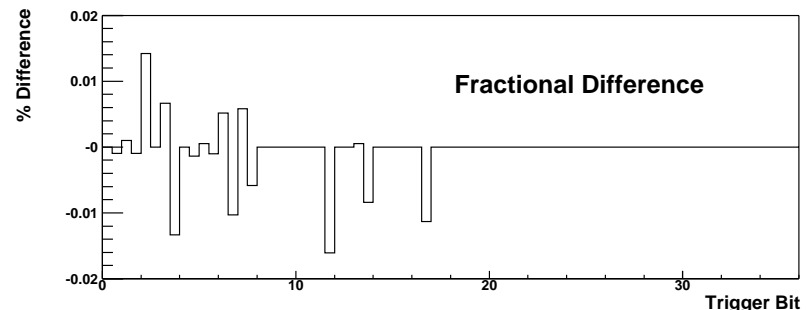
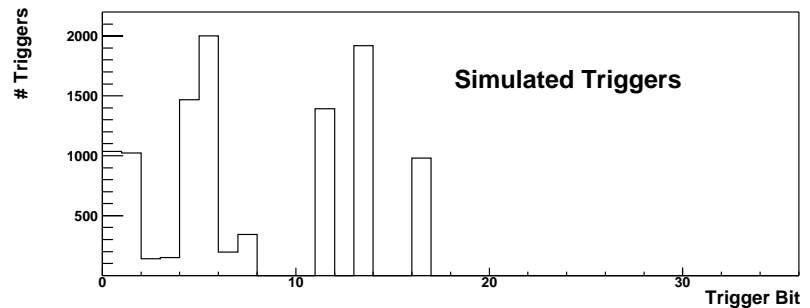
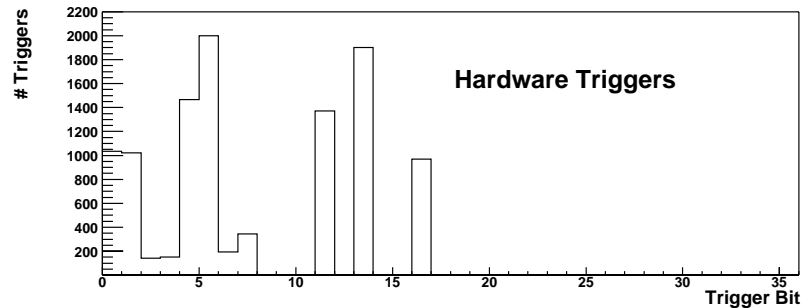
# L1MU WWW Online Page





# L1MU Certification

- Triggers found by L1MU hardware
- Triggers found by L1MU simulator
- Fractional difference



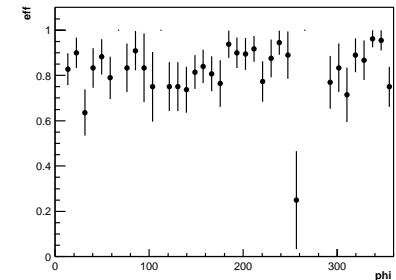
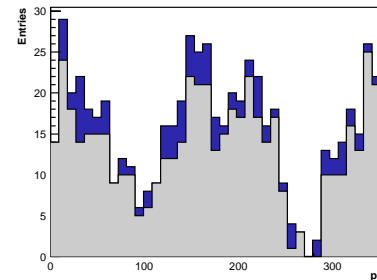
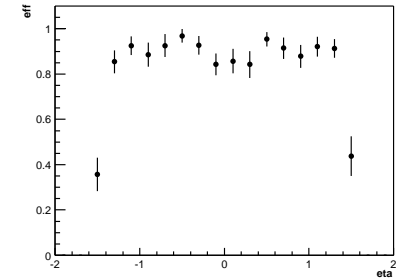
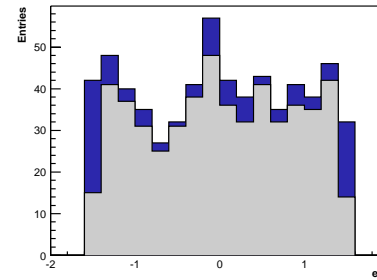
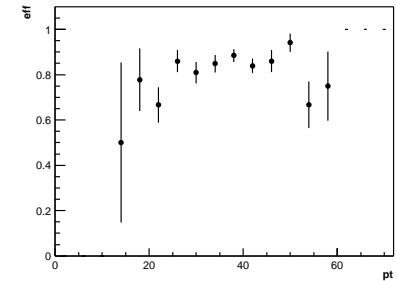
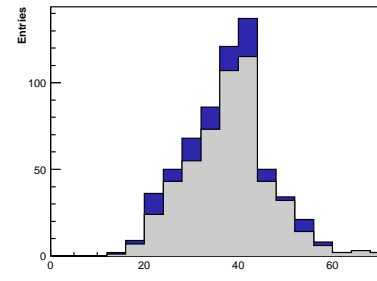
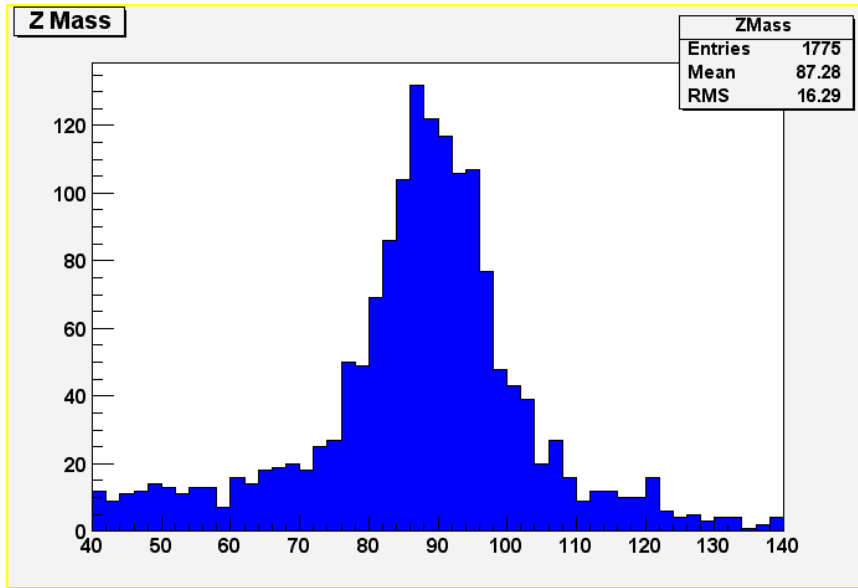




# L1MU Trigger Efficiencies from Data

MU1PT4WLXX efficiency  
wrt medium muons= 0.84

mu1pt4wlxx, # Candidates: 637, Total Eff: 0.84 $\pm$ 0.01



And we have results for  
many other L1MU efficiencies



# New Slides from RCM

---



# Updates

---

- Hardware

- ◆ Spurious parity errors from receivers fixed fall 03
  - Quick detection of bad inputs/cables from new GUI
- ◆ MTCxx synch problem fixed? Fall 04
  - Reliable readout of input data
  - Used to verify mapping of ~300 PDT FEB-CB cables during fall 04 shutdown

- Power Supplies

- ◆ All PS fixed Dec. 2003, no failures since (knock knock)
- ◆ Spare modules for all voltages
- ◆ New L1Muon load
  - Test all voltages and PS readout and control (via teststand RM)



# Updates

---

- **Firmware**

- ◆ Added tight wire triggers in central and forward
- ◆ Optimized scintillator roads in central bottom
  - Add tight and loose count-to-2
  - Fix bug in tight CFT.scint trigger in octant 6
- ◆ Expand 'wide' region to  $|\eta| < 1.6$

- **Simulator**

- ◆ Add forward tight wire triggers, central in 1 month
- ◆ All scint roads .rcp-based (including new central bottom)
- ◆ Online hourly plots stored for a week





# Monitoring and Download

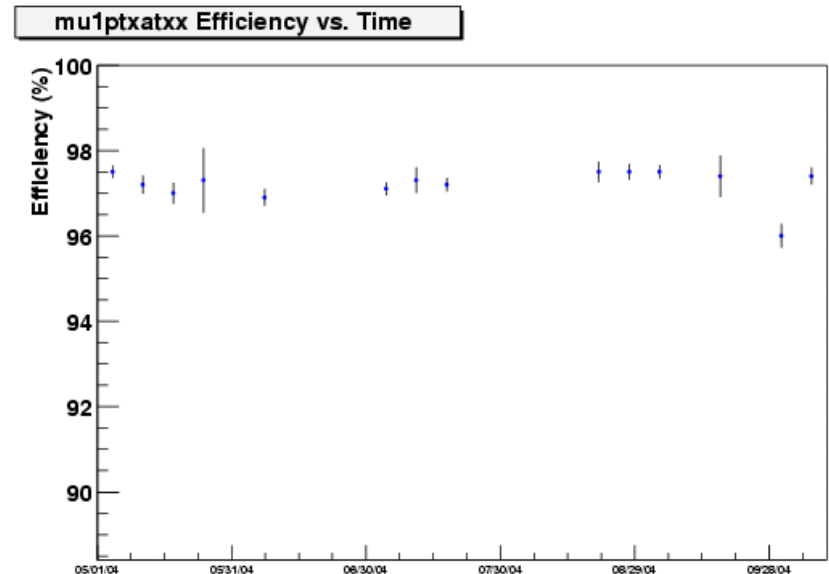
---

- Moved to direct ethernet-based monitoring of crates
  - ♦ 1553 monitoring and download verification prone to 'stale data' problem
  - ♦ Monitor any VME address directly from 68040 via EPICS
- GUI monitors lock, FIFO full, and parity error registers
- Coord download of trigger managers through same path
  - ♦ Dynamic downloading tested for all trigger managers



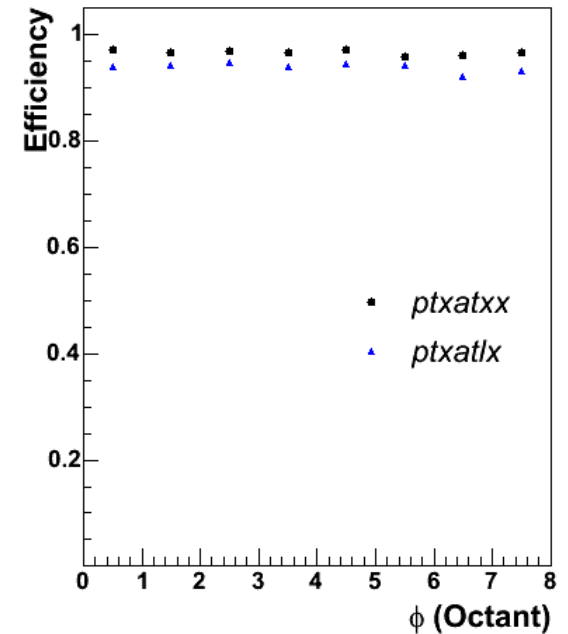
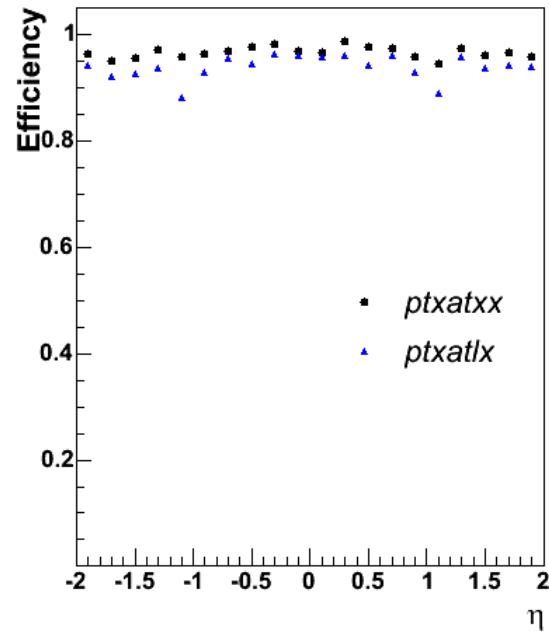
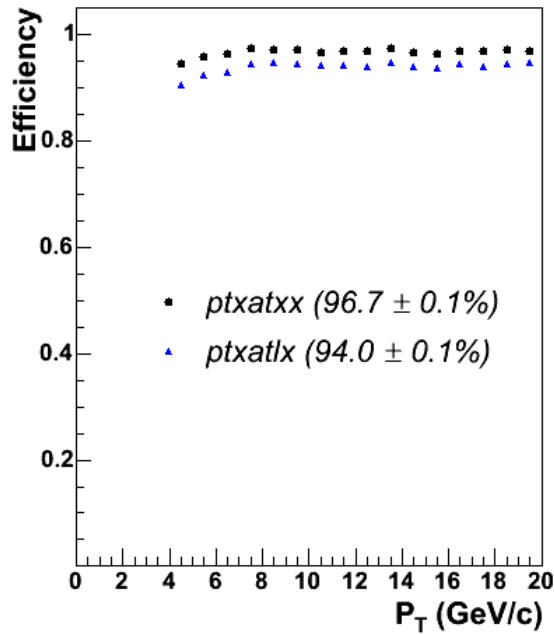
# Trigger Efficiencies

- Monitored weekly from data skims
- Plotted for scintillator, wire, and CFT
  - ♦ Use events from jet and EM triggers (unbiased)
  - ♦ Denominator is medium muons AND BC scint requirement, num is denom.L1 trigger
- Part of weekly L1Muon expert checklist
- Available on web





# Trigger Efficiencies





# Crate Monitoring GUI

---